

## CATCH ESTIMATION WORKSHEET

This worksheet contains detailed information about obtaining and recording catch weight information for sea life and/or debris taken by a scallop or trawl vessel. The worksheet also aids in the organization and illustration of observer's catch estimation methodology and work. The worksheet should be used for **every** haul to illustrate observer work or catch estimation methods. Actual weights are the observer's priority but may not always be possible to obtain. Critically important and managed species of Closed Areas and Special Area Programs have the highest priorities and the observer must take actual weights of these when possible. Therefore, if actual weights cannot be obtained this worksheet is used to organize catch estimation methods.

Subsampling coupled with the volume to volume method are tools to help the observer estimate large catches onboard trawl or scallop vessels that dump the catch on deck. Use frequency of subsampling and the volume to volume method will depend on trip type and circumstances. If the catch is pumped the observer should use the Catch Composition Log to estimate total catch weights. The Catch Composition Log is used to estimate total catch weights from catch that occur in very large quantities thus must be pumped.

As part of their required work observers must first develop an action plan and share this action plan with the captain and crew. For example, before fishing operations begin the observer should take aft deck, fish bin and container measurements. Standard measurements for some containers are given (1.47 ft<sup>3</sup> for orange baskets and 2.65 ft<sup>3</sup> for fish totes).

Once the catch is dumped on deck the observer should gauge the size of kept versus discards within the pile. Then if possible to facilitate catch management, the observer should first allow the crew to remove the kept catch. Working with the fishers

to separate the catch to catch disposition will make catch estimation work easier. Next, the observer should judge the volume of discards. For example, if discard volume is large and many estimations are expected the observer should estimate total catch weights through a subsample, and/or by using other catch estimation methods including taking actual weights (according to priority of species). Before sub-sampling the observer should try to remove few or manageable large and/or small sea life and debris and obtain actual weights. Taking as many actual weights as possible, before subsampling will address priorities (actual weights), make subsampling easier (especially when removing larger species first) and reduce inflating weight estimations from choosing fish that occur at a low frequency too often. See Figure 1.

Because of stratification of sea life and debris, it is pertinent that a random and representative subsample of the pile is collected. The subsampling volume obtained should be  $\geq 20\%$  of the total catch volume. Dividing the catch into a mental grid will facilitate random removal of subsampling material. The subsampling portion taken should come from the top, middle and bottom layers of the pile. To aid randomness, a shovel can be used to sort subsample materials into containers. The goal is to take many random small portions from numerous areas of the catch instead of large portions from few areas. Taking catch materials from few areas will skew weight estimates since the catch may stratify. Additionally, if a subsample is too small or not randomly picked total weight estimates may result in being too large or small when visually compared to the catch, therefore not representing the catch composition accurately.

If the volume to volume method is recorded as a catch estimation method then complete fields 4-12. Multiply the subsample weight by the sample

weight multiplier to obtain the total estimated catch weight for the Haul Log. The weight recorded on the Haul Log is always an estimate.

If there are insufficient lines on one form for all species sub-sampled in this haul, continue listing species on an additional catch estimation worksheet, making sure to complete all of the Header Information (A-B and 1).

## DEFINITIONS

**Area (ft<sup>2</sup>):** The amount of space in a flat surface measured in square units. Recorded in square feet.

**Basket or Tote Count (A x B + C):** Estimates of kept catch can be calculated by basket or tote counts when the kept is separated by species into containers. [Note: Do not forget to tare or subtract the weight of container used to hold the catch.] To perform this method, take an average weight per container (A), multiply this average weight by the total number of containers filled to the same level (B) and add any container weight that may be different, i.e.,  $\frac{1}{2}$  filled container (C).

**Captain's Estimates:** Sometimes due to safety concerns, weather conditions or target catch volumes, the total catch weights can be obtained by the captain. This method should **rarely** be used. Comments must be made as to why this method was chosen.

**Catch Depth (D):** The actual depth of the catch from which the observer intends to calculate a volume. If the catch is first sorted by catch disposition and/or if species and/or debris are removed in order to take actual weights before subsampling, the catch depth should be taken afterwards to obtain the actual depth in order to calculate an accurate volume. Record in feet.

**Diameter:** A straight line that passes from side to side through the center of a circular object. Record in feet.

**Fish Tote:** Commonly known as the 70 liter or 100 lb. fish tote which is the standard for seafood handling in the North Atlantic. Equivalent to fish totes commonly seen in the gillnet fishery. NEFOP standard flush volume of 2.65 ft<sup>3</sup>.

**Length:** Distance from one end to another.

**Long Radius (r<sub>2</sub>):** Long radius is measured when a circular shape is irregular (i.e., ellipse) to obtain an average radius. The long radius is defined as the

distance from the center of a circle to the furthest point on the perimeter. Record in Feet.

**Long Width (W<sub>2</sub>):** Long width is measured when an angular shape is irregular (i.e., trapezoid) to obtain an average width. Record in feet.

**Orange Basket:** Equivalent to orange bushel basket commonly seen on scallop and trawl trips. NEFOP standard flush volume of 1.47ft<sup>3</sup>.

**Partial haul sampling:** A large portion of the haul is sampled or actual weights are taken for a large portion of the haul. The rest of the haul is represented by estimated weights. See Figure 1.

**Pi (π):** The ratio of the circumference of a circle to its diameter. The value of π is 3.14.

**Radius (r):** The distance between the center of a circle and any point on the circle's circumference. Record in feet.

**Sample:** A small part of something intended to represent the whole. The fishing vessel obtains the catch or sample. A subsample is used by the observer to extrapolate total catch weights from the sample or catch.

**Sample Weight Multiplier:** Illustrates a comparative numeric proportion that is used to extrapolate total catch weights. Recorded to the hundredths.

**Short Radius (r<sub>1</sub>):** Short radius is measured when a circular shape is irregular (i.e., oval) to obtain an average radius. The short radius is defined as the distance from the center of a circle to the closest point on the perimeter. Record in feet.

**Short Width (W<sub>1</sub>):** Short width is measured when an angular shape is irregular (i.e., trapezoid) to obtain an average width. Record in feet.

**Subsample:** A subsample is used in lieu of actual weights to determine catch composition and extrapolate the total catch weight of individual sea life and/or debris for a large catch. As a guideline, a subsample is random and must represent  $\geq 20\%$  of the total catch size.

**Subsampling Containers:** Any container used to hold a subsample.

**Tally:** Stroke tally is a method where fish of similar size (i.e., dogfish) are accounted for by taking an average weight and multiplying by the collected tally.

**Total Subsample Volume:** The total volume of the subsample. This number is obtained by multiplying the total number of subsampling containers collected by the flush volume of the container used (i.e., 10.5 orange baskets x 1.47ft<sup>3</sup> flush). Recorded to the hundredths.

**Volume (ft<sup>3</sup>):** The amount of three dimensional space occupied by an object.

Area (ft<sup>2</sup>) x Depth (ft) = Volume (ft<sup>3</sup>)

**Volume to Volume:** Uses a subsample from the catch, two comparative volumes, a sample weight multiplier and actual weights from sorted sea life and/or debris. Can be combined with actual weights (i.e., partial haul sampling) or other catch estimation methods (i.e., basket or tote counts) to illustrate total catch weights and catch composition on a haul log.

**Weighted (Actual):** An actual weight taken of sea life and/or debris of a particular catch disposition and fish disposition code and catch disposition by NMFS issued scales.

**Whole haul sampling:** The sample size is the entire haul or the haul log consists of all actual weights.

**Width (W):** The greatest dimension at right angles to length or depth (height). Record in feet.

## INSTRUCTIONS

For instructions on completing fields **A, B, and E** refer to the Common Haul Log Data section of the NEFOP Manual.

**1. FISHING METHOD:** Record the method the fishers used to sort through the catch by placing an "X" next to the appropriate code:

- 1 = Picked.
- 2 = Shoveled.
- 3 = Deckloaded.
- 4 = Conveyor System.
- 8 = Combination, record all fishing methods on line 1A.
- 9 = Other, record the other fishing method(s) on line 1A.

**2. HAUL NUMBERS WHERE DECKLOADING OCCURRED:** Record the haul numbers in which the deckloading period took place.

**3. CATCH ESTIMATION METHOD:** Record the method used to estimate total catch weights of sea life and/or debris for this haul by placing an "X" next to the appropriate code:

- 1 = Weighed (Actual).
- 2 = Volume to Volume.
- 3 = Basket or Tote Count.
- 4 = Captain.
- 5 = Tally.
- 6 = Visually Estimated.

- 7 = Cumulative Sum Method.
- 8 = Combination, record all catch estimation methods on line 3A.
- 9 = Other, record the catch estimation method on line 3A. Illustrate why and how this method was used in the comment section of this worksheet.

**NOTE:** If the haul is unobserved but kept in formation is obtained from the Captain, then Captain (4), must be recorded as the Catch Estimation Method.

**NOTE:** Visual estimates should rarely be used except when estimating very large objects or for accounting for objects such as seaweed attached to fishing gear or very fine and unevenly distributed items such as clay and sand. Comments must be provided when using this method.

## 4. CATCH SHAPE, MEASUREMENTS & VOLUME:

Record the catch shape and measurements for this haul by placing an "X" next to the appropriate code. Record each measurement in feet and calculate all measurements or the total catch volume as cubic feet. Round to the nearest hundredths place. Use the appropriate equation to calculate the volume.

- 1 = Rect./square.
- 2 = Trapezoidal.
- 3 = Triangular.
- 4 = Circular.
- 5 = Oval.
- 8 = Combination, record all catch shapes on line 4A.
- 9 = Other, record the other catch shape(s) and measurements on line 4A.

**NOTE:** An observer might encounter a combination of shapes. Irregular shapes can be divided into similar shapes to make calculations easier. Record all calculations, measurements, and shapes used in the comment section of this worksheet. Add all shape volumes to obtain the total catch volume. Record all measurements and calculations in the comment section.

**NOTE:** "D" means catch depth not bin height. Likewise if sea life and/or debris are removed first before subsampling take the catch depth measurement afterwards.

**5. CATCH MEASUREMENTS THE SAME?:**

Record whether the catch measurement, excluding catch depth, is the same as the previous haul by placing an "X" next to the appropriate code:

- 0 = No.  
1 = Yes.

**6. # SUBSAMPLING CONTAINERS USED:**

Record the number of subsampling containers used to the hundredths place if necessary (*i.e.*, 10.25). Record when volume to volume is used as a catch estimation method.

**NOTE:** Remember to subtract or tare the container weight used to organize the subsample.

**NOTE:** If a fish bin is used to sort a subsample this is considered one subsampling container.

**NOTE:** If subsampling containers are not available or a fish bin, *i.e.*, the subsample is organized on deck and circular measurements are taken, record a dash (-) in the field.

**7. VOLUME SUBSAMPLE CONTAINER:**

Record, to the nearest hundredths place in cubic feet (ft<sup>3</sup>), the volume of the subsampling container used to organize the subsample by placing an "X" next to the appropriate code.

- 1 = 1.47 ft<sup>3</sup> (Orange Basket)  
2 = 2.65 ft<sup>3</sup> (fish tote)  
9 = Other (ft<sup>3</sup>), record the volume of any other subsampling container on line 7A in Cubic feet.

**NOTE:** The volume of the subsampling container is equal to the volume of the subsample flush to the wall of the container. However, if a fish bin is used to organize a subsample *i.e.*, containers are not available, record the volume of the subsample in the fish bin on line 7A and place an "X" next to other. If no containers are available, record a dash (-) in the field.

**8. TOTAL SUBSAMPLE VOLUME:** Calculate, to the nearest hundredths place in cubic feet (ft<sup>3</sup>), the subsample volume used for this haul.

**9. SAMPLE WEIGHT MULTIPLIER:** Calculate,

to the nearest hundredths place, the sample weight multiplier used to estimate total catch weights. The sample weight multiplier is calculated by dividing the total catch volume by the total subsample volume.

**10. PERCENT SUBSAMPLED:** Calculate, to the nearest hundredths place, the percent of catch subsampled for this haul. The percent subsampled is calculated by dividing the total subsample volume by the total catch volume and multiplying by 100.

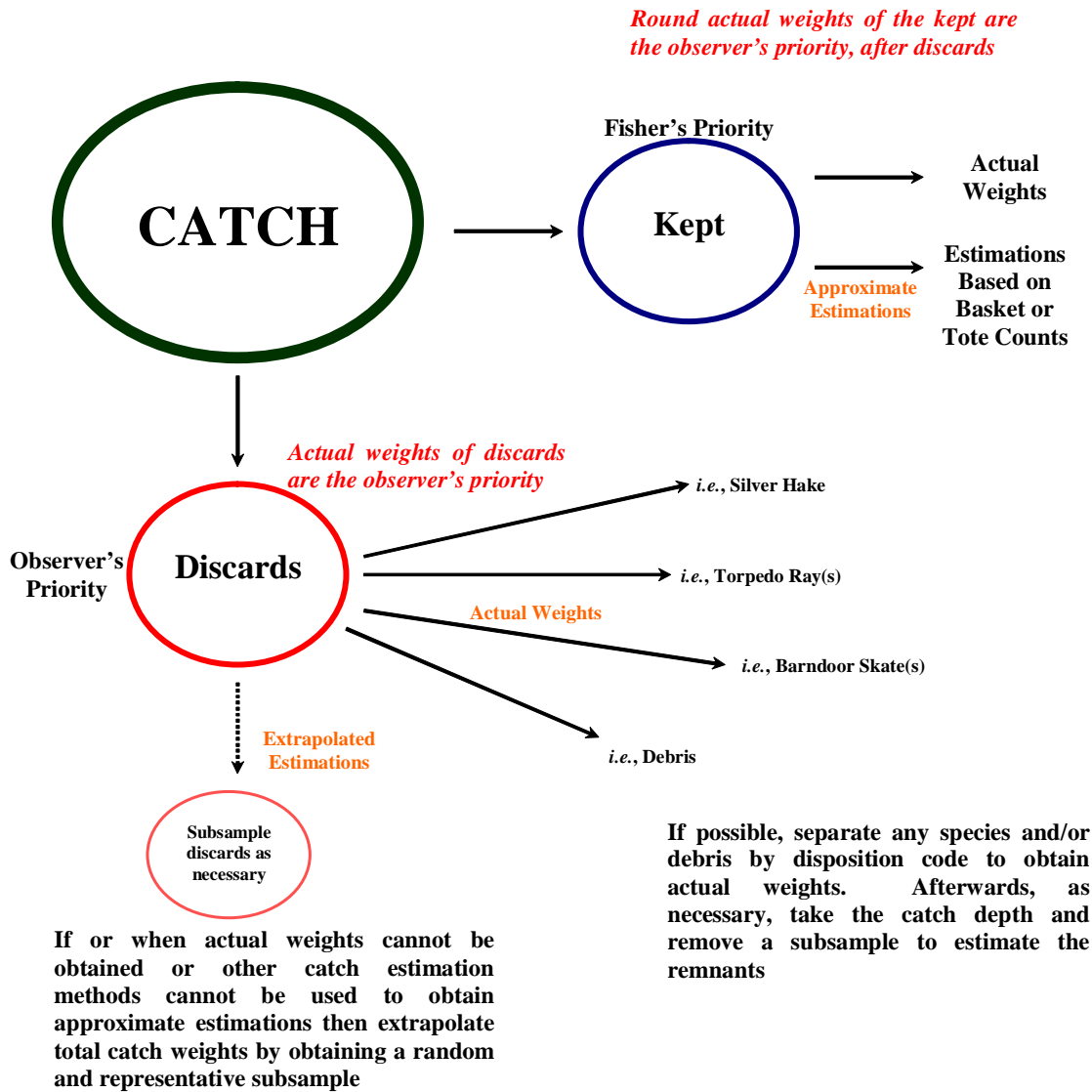
**11. SPECIES:** Record all species and/or debris of a particular fish disposition and catch disposition code within the subsample. The estimated weight of sea life and/or debris on the catch estimation worksheet should mirror what is recorded on the haul log.

**12. SUBSAMPLE WEIGHTS (LBS):** Record the actual weight of a species or debris sorted from the subsample by fish disposition code and catch disposition.

**NOTE:** Actual weights may be recorded to the nearest tenths of a pound. Estimated weights greater than 1 pound should be recorded to the nearest whole pound.

**COMMENTS**

Record any detailed additional information associated with this log (*i.e.*, description of irregular shapes or other shapes, other catch estimation methods, safety concerns, or time constraints).



**Figure 1:** Shows a scematic illustrating catch estimation and management.

Formula	Other Shape
$\pi r^2 \times D$	Bucket, cylinder
$r_1 \times r_2 \times \pi \times D$	Ellipse (Oval)
$[(W_1 + W_2) \div 2] \times L \times D$	Oblong-Shaped Oval
$L \times W \times D$	Milk Crate

**Table 1.**

**Table 1:** Illustrates other shape formulas